

## PATENT ABSTRACTS OF JAPAN

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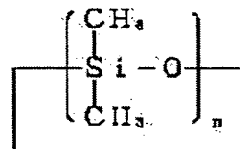
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## (54) SUSPENSION OF BORON NITRIDE

## (57)Abstract:

PURPOSE: To obtain the suspension useful as a lubricant for a sliding part and a frictional part, having flame retardancy and chemical stability free from harm to an environment and human body by blending a dimethylsiloxane cyclic material with boron nitride powder while stirring.

CONSTITUTION: This suspension is obtained by blending (A) 100 pts.wt. of a liquid dimethylsiloxane with (B) 0.1-50 pts.wt. of boron nitride powder while stirring. The component A contains preferably 70wt.% of a tetramer and a compound of the formula  $((n))$  is 3-25 is preferably used as the component A. (C) A resin-based binder is preferably depolymerizable and especially a polymethyl methacrylate is used as the component C.



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CLAIMS

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[Claim(s)]

[Claim 1] Liquefied dimethylsiloxane annular solid It is boron-nitride powder to the 100 weight sections. Boron-nitride suspension characterized by agitating 0.1 - 50 weight section and coming to mix.

[Claim 2] Boron-nitride suspension the dimethylsiloxane annular solid indicated the tetramer to be to claim 1 which is what is contained 70% of the weight or more.

[Claim 3] Boron-nitride suspension indicated to claim 1 in which boron-nitride suspension contains a resin system binder.

[Claim 4] Boron-nitride suspension indicated to claim 3 whose resin system binder is the thing of depolymerization nature.

[Claim 5] Boron-nitride suspension indicated to claim 3 whose resin system binder is polymethylmethacrylate.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention is a thing about stable boron-nitride suspension which problems, such as environmental pollution and damage over the body, do not have, either chemically in boron-nitride suspension, especially fire retardancy.

[0002]

[Description of the Prior Art] A hexagonal boron nitride (it outlines Following BN) is thermal conductivity and electric insulation, Since it has the property that difficulty wettability with lubricity, a mold-release characteristic, chemical stability, high temperature oxidation stability, melting glass, and molten metal etc. is excellent, this powder is widely used for the various applications of the adherent by printing in the case of calcinating the release agent of the bulking agent for raising thermal conductivity and/or electric insulation, the lubricant of the slide member friction section, melting glass, and a melting metal-forming mold, and other ceramics etc.

[0003] Although it generally coats a processing-object side with BN powder in aiming at lubricity, a mold-release characteristic, printing prevention, etc. especially among these applications There is no adhesion force by BN single taste, and since coating is difficult, make a solvent distribute BN powder about this, and it considers as suspension. After coating a processing-object side with this by the spray, brush coating, etc., it is made to dry and the approach of making BN coating coat form is taken. As a solvent which makes this BN suspension, water, the organic solvent, or the chlorofluocarbon system solvent is used.

[0004]

[Problem(s) to be Solved by the Invention] However, a coating layer may become heterogeneous, if it may remain as it is, without the aggregate of BN decomposing into suspension even in this case although it is difficult for BN powder to make water distribute this since a front face is hydrophobicity, therefore a surfactant is generally added and water is made to distribute BN powder if water is used as this solvent, therefore this is coated. Moreover, since there is hydrolysis nature in BN powder, if the suspension which used water carries out long duration neglect of this, the disadvantage that work environment gets worse by the ammonia gas which hydrolysis arises in reaction-formula  $2\text{BN} + 3\text{H}_2\text{O} \rightarrow \text{B}_2\text{O}_3 + 2\text{NH}_3$  \*\* of the following, and the purity of BN in suspension falls by generated B<sub>2</sub>O<sub>3</sub>, and also occurred will generate it.

[0005] Moreover, also although BN very often distributes to an organic solvent, and generate a problem like [ when using water ] and there is nothing since this is inactive also chemically when using an organic solvent as this solvent Since all organic solvents are inflammability, also although it is necessary to make all facilities of the work-site circumference into an explosion-proof specification, therefore disadvantage arises on cost on the whole, and its dispersibility of BN is good for a chlorofluocarbon system solvent and they do not have the risk of ignition with inactive chemically, either There is a possibility that use may become impossible in the near future, from it having been a problem globally in respect of environmental destruction.

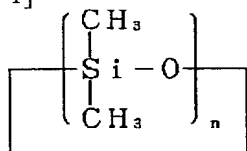
[0006]

[Means for Solving the Problem] This invention relates to BN suspension which solved such disadvantage and a trouble, and this is a dimethylpolysiloxane annular solid. It is BN powder to the 100 weight sections. It is characterized by agitating 0.1 - 50 weight section and coming to mix.

[0007] Namely, the result examined variously that this invention persons should develop BN suspension which solved the disadvantage about well-known BN suspension conventionally, A dimethylsiloxane annular solid liquefied as a dispersion medium to BN powder is used. When this dimethylsiloxane annular solid and BN powder were mixed in the agitator, a header and BN suspension obtained by doing in this way are chemically stable in BN suspension being obtained easily, and it is fire retardancy, and the harmless thing was checked also to an environment or the body and this invention was completed. This is explained further in full detail below.

[0008]

[Function] About BN suspension, churning mixing of the BN powder is carried out, and this invention becomes a liquefied dimethylsiloxane annular solid, as this was described above. Generally the dimethylsiloxane annular solid used here is a dimethyl JIKURO silane [(CH<sub>3</sub>)<sub>2</sub>SiCl<sub>2</sub>]. Hydrolysis -> it is obtained by dehydration condensation and is a general formula. [Formula 1]



It comes out, and although n shown is the thing of 3-25, the value and its rate of an abundance ratio of this n change with synthetic conditions.

[0009] However, let this thing be a dispersion medium to BN powder. Although it is, and this needs to consider as the liquefied thing whose n values are 4-25 since the trimer which is n= 3 is a solid-state From it being difficult it to make it dry, after the boiling point's n value is [ the thing of 5-25 ] high and coats this suspension The boiling point this by n= 4 It is most desirable to consider as the tetramer which is 176 degrees C, therefore this dimethylsiloxane annular solid is good to contain a tetramer 90% of the weight or more preferably 70% of the weight or more.

[0010] On the other hand, since the property of a coat may fall under the effect of the impurity which purity contains at less than 95 % of the weight, as for BN powder used here, it is desirable that purity considers as 98% of the weight or more of a thing especially 95% of the weight or more. moreover, this mean particle diameter since the front face of coating covering may not be evenly finished if it may become difficult for condensation grains to increase in number and to carry out homogeneity distribution into suspension and it exceeds 30 micrometers, when it considers as suspension in less than 0.1 micrometers -- this the range of 0.1-30 micrometers -- especially -- It is good to consider as the thing of the range of 0.5-10 micrometers.

[0011] In addition, the loadings of this BN powder are a dimethylsiloxane annular solid. BN powder to the 100 weight sections When a processed object is coated with this suspension under in the 0.1 weight sections Although to consider as the range of 0.1 - 50 weight section is needed since homogeneity cannot be made to cover BN powder, but the viscosity of suspension will rise if this is made into the amount exceeding 50 weight sections, and coating becomes difficult, let this desirable range be 5 - 20 weight section.

[0012] Although it can obtain by BN suspension of this invention agitating the above-mentioned liquefied dimethylsiloxane annular solid and above-mentioned BN powder, and mixing, since the adhesion force to a processed material may be insufficient only now, binder resin may be blended with this if needed. Although especially the class of this binder resin is not limited but general-purpose vinyl chloride resin, vinyl acetate resin, acrylic resin, polyolefin resin, etc. can be used for this, set for the application exposed to an elevated temperature like printing prevention. If vinyl chloride resin, vinyl acetate resin, etc. are used, in order that these may carbonize at an elevated temperature and a carbon component may remain, it is desirable to use depolymerization nature resin, such as acrylic resin and polyolefin resin, to this kind of hot application, and it is good to consider as the polymethylmethacrylate resin in which the adhesion force in a room temperature is especially excellent.

[0013] In addition, since there is a case where the fire-resistant grant which is one of the main purposes of this invention becomes impossible when the amount of an organic solvent increases also in this case, an intermediary is good [ since these resin is insoluble to a dimethylsiloxane annular

solid, these are good to dissolve in the organic solvent which dissolves resin, such as toluene, an acetone, and a tetrahydrofuran, and to mix, but ] for this to make resin concentration in an organic solvent as high as possible, and to lessen the amount of an organic solvent as much as possible.

[0014] Manufacture of BN suspension of this invention is agitating a liquefied dimethylsiloxane annular solid and BN powder, and mixing, as described above. Although carried out, that what is necessary is just to mix this churning and mixing to homogeneity using general-purpose machines, such as a well-known Henschel mixer, a planetary mixer, a gate mixer, the Shinagawa mixer, a ball mill, and a vibration mill, according to this, it is chemically stable at fire retardancy, and the profitableness that BN suspension which does damage to neither an environment nor the body can be obtained easily is given.

[0015]

[Example] Next, the example of this invention and the example of a comparison are given.

The dimethylsiloxane annular solid 100 weight section which contains the tetramer of an example 1 dimethylsiloxane annular solid 90%, and the BN powder and KBN(h)-SP [trade name by Shin-Etsu Chemical Co., Ltd.] 10 weight section whose mean particle diameter is 1 micrometer were mixed with the planetary mixer for 1 hour, and BN suspension was manufactured.

[0016] Subsequently, it is although this suspension was left for 20 days at the room temperature, Since this thing was fire retardancy, and was stable and after neglect did not have change of what for 20 days This It is thickness on a stainless plate with a 300mmx 300mmx thickness of 2mm. It applies by 100 micrometers. When it dried in the 200-degree C vacuum for 2 hours, that in which the dimethylsiloxane annular solid vaporized and BN adhered to homogeneity on the stainless plate was obtained, and this thing turned into what was excellent in lubricity and a mold-release characteristic. in addition, the inflammable-gas alarm indicator and FA- which was [ adhesion force ] weak a little when it touched with the finger and the situation of adhesion was investigated, although this adhesion of BN was homogeneous and which was installed in the workplace also although kicked -- 450 [the trade name by KOMYO RIKAGAKU KOGYO K.K.] did not generate the carry out and according to hydrolysis of BN ammonia smell which did not sound during the activity, either.

[0017] At the time of manufacture of BN suspension in example 2 example 1, it is the polymethylmethacrylate 1 weight section further to a dimethylsiloxane annular solid and BN powder. Although that in which BN adhered to the stainless plate at homogeneity was obtained when what was dissolved in the toluene of 4 weight sections was added and also having been processed like the example 1, when this thing was touched by hand and investigated the situation of adhesion, it had adhered in adhesion force with strong BN, and in this case, the combustible-gas alarm indicator did not sound and did not have generating of an ammonia smell, either.

[0018] Also although that in which BN adhered to the stainless plate at homogeneity was obtained and excelled when the dimethylsiloxane annular solid in example of comparison 1 example 1 was changed into the acetone, and also BN suspension was manufactured by the same approach as an example 1 and this was applied to the same stainless plate as an example 1 by brush coating, this adhesion force of BN was weak, and since the inflammable-gas alarm indicator sounded during the activity in this case, there was disadvantage of interrupting an activity.

[0019] Also although that in which BN adhered to the stainless plate is obtained and excels, when the dimethylsiloxane annular solid in example of comparison 2 example 1 was changed into surfactant content water, and also BN suspension is manufactured by the same approach as an example 1 and this is applied to the same stainless plate as an example 1 by brush coating, this adhesion of BN was uneven, its adhesion force was also weak, it carried out and the according to hydrolysis of BN to workroom ammonia smell which the thing lubricity and whose mold-release characteristic were small, and which an inflammable-gas alarm indicator sounds during an activity did not have also although kicked also generated these physical properties at this.

[0020]

[Effect of the Invention] Although this invention relates to BN suspension, this thing is what agitated a dimethylsiloxane annular solid and BN powder and was mixed. If this can be obtained as what was chemically stabilized in fire retardancy, and this is applied to the front face of a processed article and it dries from a certain thing, BN coating covering can be easily formed on this, and the profitableness that the damage over environmental pollution or the body is not generated at all will be given to this.